sixth examples, and further includes wherein the two electric motors include a first electric motor and a second electric motor, wherein a first reduction gearbox is coupled to the first electric motor between an output of the first electric motor and a first front axle shaft, and wherein a second reduction gearbox is coupled to the second electric motor between an output of the second electric motor and a second front axle shaft. An eighth example of the system optionally includes one or more or each of the first through seventh examples, and further includes wherein a length from a first end of the crankshaft to a second end of the crankshaft is positioned parallel to a longitudinal axis of the vehicle. A ninth example of the system optionally includes one or more or each of the first through eighth examples, and further includes an integrated starter motor/generator mechanically coupled to a crankshaft of the engine and electrically coupled to the two electric motors. A tenth example of the system optionally includes one or more or each of the first through ninth examples, and further includes a plurality of engine mounts coupling the engine to a frame of the vehicle, with each electric motor of the two electric motors coupled to a different engine mount of the plurality of engine mounts.

[0076] As another embodiment, a system comprises: twin, independent, electric motors mounted to either side of an exterior of an oil pan of a longitudinally mounted engine in a rear wheel drive vehicle; and twin reduction gearboxes, each reduction gearbox of the twin reduction gearboxes positioned between an output of one of the twin electric motors and one of two front axle shafts of front wheels of the rear wheel drive vehicle. In a first example of the system, the engine is mechanically coupled to rear wheels of the vehicle by a crankshaft of the engine, and the engine is not mechanically coupled to front wheels of the vehicle by the crankshaft. A second example of the system optionally includes the first example, and further includes a transmission coupled to the crankshaft of the engine, the transmission positioned along a longitudinal axis of the vehicle at a rear end of the engine. A third example of the system optionally includes one or both of the first and second examples, and further includes wherein the engine is a V-engine including two opposing cylinder banks, and wherein the electric motors are mounted to the exterior of the oil pan vertically below the cylinder banks relative to a surface on which the vehicle sits.

[0077] As another embodiment, a vehicle comprises: an engine including an engine block and an oil pan mounted to the engine block; two rear wheels driven by the engine; two front wheels not rotationally coupled to the engine; two, independent, electric motors, where each motor of the two electric motors drives a different one of the two front wheels and is coupled to an opposite, different side of each of the oil pan and the engine block; and two reduction gearboxes, each reduction gearbox coupled between and to each of an output of one of the two electric motors and one of the two front wheels. In a first example of the vehicle, each electric motor of the two electric motors includes a first plurality of arms extending in an outward direction away from a central axis of a cylindrical section of a housing of each electric motor. A second example of the vehicle optionally includes the first example, and further includes wherein each arm of the first plurality of arms includes an axial extension coupling the housing of each electric motor to the oil pan. A third example of the vehicle optionally includes one or both of the first and second examples, and further includes wherein each electric motor includes a second plurality of arms coupling the housing of each electric motor to engine mounts of the engine. A fourth example of the vehicle optionally includes one or more or each of the first through third examples, and further includes wherein each arm of the first plurality of arms extends across a length of the oil pan in a direction of a longitudinal axis of the engine and a height of the oil pan in a vertical direction relative to a ground surface on which the vehicle sits, and wherein each arm of the second plurality of arms extends in the vertical direction and is coupled to an engine mount of the engine.

[0078] In another representation, a system comprises: a longitudinally mounted engine adapted to drive rear wheels of a vehicle; an electric machine adapted to drive the rear wheels, the electric machine and engine selectably coupled to the rear wheels by a plurality of clutches; and two, independent, electric motors mounted to the engine, on opposite sides of the engine, and adapted to drive front wheels of the vehicle, where the two electric motors are not rotationally coupled to the engine.

[0079] Note that the example control and estimation routines included herein can be used with various engine and/or vehicle system configurations. The control methods and routines disclosed herein may be stored as executable instructions in non-transitory memory and may be carried out by the control system including the controller in combination with the various sensors, actuators, and other engine hardware. The specific routines described herein may represent one or more of any number of processing strategies such as event-driven, interrupt-driven, multi-tasking, multi-threading, and the like. As such, various actions, operations, and/or functions illustrated may be performed in the sequence illustrated, in parallel, or in some cases omitted. Likewise, the order of processing is not necessarily required to achieve the features and advantages of the example embodiments described herein, but is provided for ease of illustration and description. One or more of the illustrated actions, operations and/or functions may be repeatedly performed depending on the particular strategy being used. Further, the described actions, operations and/or functions may graphically represent code to be programmed into non-transitory memory of the computer readable storage medium in the engine control system, where the described actions are carried out by executing the instructions in a system including the various engine hardware components in combination with the electronic controller.

[0080] It will be appreciated that the configurations and routines disclosed herein are exemplary in nature, and that these specific embodiments are not to be considered in a limiting sense, because numerous variations are possible. For example, the above technology can be applied to V-6, I-4, I-6, V-12, opposed 4, and other engine types. The subject matter of the present disclosure includes all novel and non-obvious combinations and sub-combinations of the various systems and configurations, and other features, functions, and/or properties disclosed herein.

[0081] The following claims particularly point out certain combinations and sub-combinations regarded as novel and non-obvious. These claims may refer to "an" element or "a first" element or the equivalent thereof. Such claims should be understood to include incorporation of one or more such elements, neither requiring nor excluding two or more such elements. Other combinations and sub-combinations of the disclosed features, functions, elements, and/or properties